

Application Serial No. 09/863,181
Dated: April 18, 2006
Reply to Office Action dated January 18, 2006

Page 2 of 30

Listing of the Claims:

1. (Currently Amended) A rotary die apparatus ~~for use with~~ having a first rotary die having with a first axis of rotation and a second rotary die having with a second axis of rotation parallel to the first axis of rotation comprising:

a frame having a first configuration for a low speed mode of operation below 600 linear feet per minute and a second configuration for a high speed mode of operation above 600 linear feet per minute, the frame including:

a base;

a plurality of elongate columns, each column having a first end and a second end defining a path of travel along a length thereof, the first end of each column mounted to the base in spaced relationship to one another;

~~at least one cross member~~ a pair of cross members positioned transverse to the first and second axis of rotation, each cross member movably engaged with respect to at least two of the plurality of columns for movement of the entire cross member vertically along the path of travel; and

a die support kit operably engagable with the frame, the die support kit including interchangeable die supports for at least one of the first configuration for low speed mode of operation and the second configuration for high speed mode of operation, the die support kit for the first configuration for low speed mode of operation including:

a first modular die support including at least four rollers, each roller mounted directly to the base ~~separate and independent of the plurality of columns, the first modular die support~~ in a location spaced from the columns, the

Application Serial No. 09/863,181

Page 3 of 30

Dated: April 18, 2006

Reply to Office Action dated January 18, 2006

first modular die support in ~~[[sole]]~~ rolling engagement with and ~~[[solely]]~~ maintaining the first rotary die in a stationary rotary position upwardly, horizontally transverse to the first axis of rotation and longitudinally along the first axis of rotation with respect to the base and ~~independent of the columns~~; and

a second modular die support including at least four rollers, at least two rollers mounted to ~~[[the]]~~ each cross member in a location spaced from the columns, the second modular die support adjustably loading force between the first and second rotary dies while in rolling, vertically downwardly pressing engagement with the second rotary die.

2. (Cancelled)

3. (Withdrawn) The apparatus of claim 1 wherein the first die is in rolling engagement with the second die.

4. (Withdrawn) The apparatus of claim 9 wherein the first rotary die further comprises a first end surface and an opposite second end surface, the first die having a radially raised flange adjacent to the first and the second end surfaces.

5. (Withdrawn) The apparatus of claim 4 wherein each of the raised flanges defines a shoulder operably engageable with the corresponding rollers of the first bearing and the second bearing of the first modular die support to limit linear longitudinal translation of the first die along the first axis of rotation.

Application Serial No. 09/863,181

Page 4 of 30

Dated: April 18, 2006

Reply to Office Action dated January 18, 2006

6. (Withdrawn) The apparatus of claim 5 wherein each of the raised flanges defines a shoulder operably engageable with a corresponding end of the second die to limit linear longitudinal translation of the second die along the second axis of rotation.

7. (Withdrawn) The apparatus of claim 1 wherein the cross member further comprises a first cross member and a second cross member, the first and second cross members positioned on mutually exclusive, opposing sets of columns located in spaced relationship with respect to one another.

8. (Withdrawn) The apparatus of claim 1 further comprising a pressure member operably engaged with the cross member for selectively adjusting the position of the cross member along the path of travel.

9. (Withdrawn) The apparatus of claim 1 wherein the first and the second modular die supports each exclusively comprise a first bearing assembly and a second bearing assembly positioned in longitudinally spaced locations adjacent each end of the corresponding first and second rotary dies, each bearing having at least two rollers with axes of rotation extending substantially parallel to one another and each roller angularly spaced from one another with respect to the axis of rotation of the corresponding first and second rotary dies.

Application Serial No. 09/863,181

Dated: April 18, 2006

Reply to Office Action dated January 18, 2006

Page 5 of 30

10. (Withdrawn) The apparatus of claim 1 wherein the first rotary die and the second rotary die each further comprise a first end surface and an opposite second end surface, each die having an elongate journal extending from the first and second end surfaces along the axis of rotation; and

the first and second modular die supports each further comprising a pair of cylindrical roller bearings independent of and spaced from the columns positioned along the axis of rotation, each cylindrical roller bearing operably engaged with one of the journals for permitting free rotation of the die about the axis of rotation.

11. (Withdrawn) The apparatus of claim 10 further comprising at least one spacer positioned between the first and the second modular die supports.

12. (Withdrawn) A rotary die apparatus comprising:

a frame having a base, a plurality of elongate circular columns having a first end and a second end defining a first axis of movement along a length thereof, the first ends of the columns removably mounted with respect to the base and the second ends of the columns removably mounted with respect to a cover, at least one cross member, the cross member movably engagable with respect to at least two of the plurality of circular columns for movement along the first axis;

a first rotary die having a first axis of rotation, the first die having a first end surface and an opposite second end surface, and a raised radial flange adjacent the first and second end surfaces;

Application Serial No. 09/863,181

Dated: April 18, 2006

Reply to Office Action dated January 18, 2006

Page 6 of 30

a second rotary die having a second axis of rotation positioned in substantially parallel alignment with the first axis of rotation and rollingly engaged with the first die, the second die having a first end surface and an opposite second end surface positioned axially inward of the radial flanges and operably engaged with the radial flange of the first die to limit linear translation of the second die along the second axis of rotation, the cross member positioned transverse to the second rotary die having the second axis of rotation;

a first modular die support removably mounted directly to the base in a location spaced from the columns, the first die support having a first bearing member and a second bearing member, the second bearing member separated from the first bearing member along the first axis of rotation, the first and second bearing members each having at least two rollers each roller having an axis of rotation substantially parallel to one another and angularly spaced from one another with respect to the first axis of rotation providing exclusive support vertically and horizontally transverse to the first axis of rotation through rolling engagement with the first rotary die, at least one of the first and second bearing members operably engaged with the raised radial flange to limit movement of the first rotary die longitudinally along the first axis of rotation; and

a second modular die support removably mounted directly to the cross member in a location spaced from the columns, the second die support having a first bearing and a second bearing member, the second bearing member separated from the first bearing member along the second axis of rotation, the first and second bearing members each having at least two rollers in exclusive rolling vertical

Application Serial No. 09/863,181
Dated: April 18, 2006
Reply to Office Action dated January 18, 2006

Page 7 of 30

downwardly pressing engagement with the second rotary die, each roller having an axis of rotation substantially parallel to one another and angularly spaced from one another with respect to the second axis of rotation.

13. (Currently Amended) An improved rotary die apparatus ~~for use~~ with having a first rotary die having with a first axis of rotation and a second rotary die having with a second axis of rotation, the second axis of rotation parallel to the first axis of rotation, the apparatus having a frame including a base, a cover opposite the base, a pair of opposing cross members positioned transverse to the first and second axis of rotation, the cross members moveable between the base and the cover, and a pressure member operably engaged with the cover and the cross members, the improvement comprising:

the frame having a first configuration for a low speed mode of operation below 600 linear feet per minute and a second configuration for a high speed mode of operation above 600 linear feet per minute, the frame further including:

four elongate columns having a first end and a second end, the first end mounted to the base parallel and spaced from one another, and the second end mounted to the cover defining a length, the columns having a uniform cross section along the length between the base and the cover;

a die support kit operably engagable with the frame, the die support kit including interchangeable die supports for at least one of the first configuration for low speed mode of operation and the second configuration for high speed mode of

Application Serial No. 09/863,181

Page 8 of 30

Dated: April 18, 2006

Reply to Office Action dated January 18, 2006

operation, the die support kit for the first configuration for low speed mode of

operation including:

a first modular die support having a first bearing and a second bearing positioned spaced from one another with respect to the first axis of rotation, each bearing mounted directly on the base in a location spaced from the columns, each bearing having at least two rollers, each roller having an axis of rotation substantially parallel to one another and angularly spaced from one another with respect to the first axis of rotation, the rollers in ~~[[sole]]~~ rolling engagement and ~~[[solely]]~~ maintaining the first rotary die in a stationary rotary position upwardly, horizontally transverse to the first axis of rotation and longitudinally along the first axis of rotation with respect to the base ~~and independent of the columns~~, the rollers in operable engagement with a raised radial flange on each of a first and a second end of the first rotary die to limit linear translation of the first rotary die along the first axis of rotation; and

a second modular die support having a first bearing and a second bearing positioned spaced from one another with respect to the second axis of rotation, each bearing mounted to one of the cross members spaced from the columns in rolling engagement with the second rotary die.

14. (Cancelled)

15. (Previously Presented) The apparatus of claim 13 wherein the second die further comprises a first end and an opposite second end positioned

Application Serial No. 09/863,181
Dated: April 18, 2006
Reply to Office Action dated January 18, 2006

Page 9 of 30

axially inward of the raised radial flanges, each of the first and the second ends operably engagable with the adjacent radial flange of the first die to limit linear translation of the second die along the second axis of rotation.

16. (Currently Amended) The apparatus of claim 13 wherein the first and second bearing of the second modular die support comprise at least two rollers, each roller having an axis of rotation substantially parallel to one another and angularly spaced from one another with respect to the second axis of rotation, the first and the second bearings in rolling engagement with and ~~[[solely]]~~ maintaining the second rotary die in a stationary rotary position in a horizontal direction transverse to the second axis of rotation.

17. (Currently Amended) The apparatus of claim 13 wherein each of the first and the second bearings of the second modular die support of the die support kit for the high speed mode of operation further comprise a cylindrical roller bearing for rolling engagement with a journal on the second die.

Claims 18-35 (Cancelled)

36. (Cancelled)

37. (Withdrawn) The rotary die apparatus of claim 1 wherein the elongate columns are uniform and circular in cross section along the length.

Application Serial No. 09/863,181
Dated: April 18, 2006
Reply to Office Action dated January 18, 2006

Page 10 of 30

38. (Cancelled)

39. (Withdrawn) The rotary die apparatus of claim 12 wherein the elongate columns are uniform in cross section along the length.

40. (Withdrawn) A rotary die module for use with a first rotary die having a first axis of rotation and a second opposing rotary die having a second axis of rotation, the rotary die module comprising:

a base;

four parallel elongate rods having a first end and a second end defining a first axis of movement along a length thereof, the first ends of the rods mounted to the base, the rods spaced with respect to one another defining two pair of opposing rods with one pair of rods adjacent each end of the base, the second ends of the rods mounted to a cover, the rods having a uniform cross section along the length between the cover and the base;

a pair of opposing cross members, each cross member positioned on one pair of rods and extending transverse to the first and second axis of rotation, each cross member movably engaged on the rods for movement along the first axis of movement;

a first modular die support having a first bearing and a second bearing, the second bearing positioned spaced from the first bearing with respect to the first axis of rotation, each bearing having at least two rollers, each roller having an axis of rotation substantially parallel to one another and angularly spaced from one another

Application Serial No. 09/863,181
Dated: April 18, 2006
Reply to Office Action dated January 18, 2006

Page 11 of 30

with respect to the first axis of rotation, each bearing attached directly to the base spaced from the columns, the first die support providing exclusive support vertically, horizontally transverse to the first axis of rotation and longitudinally along the first axis of rotation through engagement with the first rotary die, the rollers of at least one of the first and second bearings operably engaging a shoulder defined by a raised radial flange on the first rotary die to limit linear longitudinal translation of the first rotary die along the first axis of rotation;

a second modular die support having a first bearing and a second bearing, the second bearing positioned spaced from the first bearing with respect to the second axis of rotation, each bearing having at least two rollers, each roller having an axis of rotation substantially parallel to one another and angularly spaced from one another with respect to the second axis of rotation, each bearing directly attached to one of the cross members spaced from the rods to receive and rotatably engage the second rotary die; and

a pressure member engaged with the cover and the cross members for controlling movement of the second modular die support along the first axis of movement.

Claims 41-45 (Cancelled).

46. (Withdrawn) A rotary die apparatus comprising:

a base;

a lower die support bearing mounted directly to the base;

Application Serial No. 09/863,181
Dated: April 18, 2006
Reply to Office Action dated January 18, 2006

Page 12 of 30

a first elongate rotary die rollingly supported on the die support bearing;

a second elongate rotary die rollingly supported with respect to the first rotary die, the first and second rotary dies having a maximum outer diameter;

a plurality of elongate columns mounted directly to the base, at least two pair of columns, each pair positioned adjacent opposite ends of the first and the second rotary die, each column of each pair of columns spaced from one another by a distance greater than the maximum outer diameter of the first and second rotary dies with sufficient clearance to allow removal and replacement of at least one of the first and second rotary dies longitudinally between one of the pairs of columns;

a cross member extending between and movably engaged with one of the pairs of columns; and

an upper die-support bearing mounted to the cross member for rolling engagement with the second rotary die.

47. (Currently Amended) A modular rotary die apparatus ~~for use with~~ having a first rotary die having with a first axis of rotation and a second rotary die having with a second axis of rotation parallel to the first axis of rotation comprising:

a frame having a first configuration for a low speed mode of operation below 600 linear feet per minute and a second configuration for a high speed mode of operation above 600 linear feet per minute, the frame including:

a base;

Application Serial No. 09/863,181

Page 13 of 30

Dated: April 18, 2006

Reply to Office Action dated January 18, 2006

a plurality of independent elongate columns, each ~~[[rod]]~~
column having a first end and second end defining a path of travel along a length thereof, the first end of each column mounted to the base in spaced relation to one another;

a cross member engaged with at least two of the plurality of columns for movement of the entire cross member along the path of travel; and

a die support kit operably engagable with the frame, the die support kit including interchangeable die supports for at least one of the first configuration for low speed mode of operation and the second configuration for high speed mode of operation, the die support kit including:

a first modular die support interchangeable between the first configuration for low speed mode of operation ~~a low speed die support operable below 600 linear feet per minute and the second configuration for high speed mode of operation~~ ~~a high speed die support operable above 600 linear feet per minute;~~ and

a second modular die support interchangeable between the first configuration for low speed mode of operation ~~the low speed die support and the second configuration for high speed mode of operation~~ ~~the high speed die support~~ , in each mode of operation the first modular die support mounted to the base spaced from the columns in ~~[[sole]]~~ rolling engagement with the first rotary die, the first modular die support ~~[[soley]]~~ maintaining the first rotary die in a stationary rotary position with respect to the base ~~independent of the columns~~ and the second modular die support mounted to the cross member spaced from the columns in rolling engagement with the second rotary die to ~~[[solely]]~~ maintain the second rotary die in

Application Serial No. 09/863,181
Dated: April 18, 2006
Reply to Office Action dated January 18, 2006

Page 14 of 30

a stationary rotary position in a horizontally transverse direction with respect to the second axis of rotation independent of the columns.

48. (Withdrawn) The modular die frame of claim 47 wherein the first and the second modular die supports are adapted for low speed applications.

49. (Currently Amended) The modular die apparatus of claim 47 wherein the ~~low speed die support~~ first configuration further comprises a first bearing assembly and a second bearing assembly positioned in longitudinally spaced locations along the axis of rotation of at least one of the first and the second rotary dies, each of the first and the second bearings having at least two rollers with axes of rotation substantially parallel to one another and each roller angularly spaced from one another with respect to the axis of rotation of the corresponding rotary die.

50. (Currently Amended) The modular die apparatus of claim 49 wherein the first rotary die further comprises a first end surface and an opposite second end surface, the first rotary die having a radially raised flange adjacent to the first and second end surfaces, the first and the second ~~bearing~~ rollers operably engage the corresponding raised radial flange along the first axis of rotation to limit linear translation of the first rotary die along the first axis of rotation.

51. (Cancelled)

Application Serial No. 09/863,181
Dated: April 18, 2006
Reply to Office Action dated January 18, 2006

Page 15 of 30

52. (Previously Presented) The modular die apparatus of claim 50 wherein the second rotary die includes a first end and a opposite second end positioned between and operably engaged with the raised radial flanges along the second axis of rotation to limit longitudinal translation of the second rotary die with respect to the first rotary die.

53. (Currently Amended) The modular die apparatus of claim 47 wherein the ~~high speed die support~~ second configuration further comprises a cylindrical roller bearing operably engaged with a journal extending from a first end and a second end of at least one of the first and the second rotary dies along the respective rotary die axis of rotation.

54. (Currently Amended) A modular rotary die apparatus ~~for use with~~ having a first rotary die having with a first axis of rotation and a second rotary die having with a second axis of rotation parallel to the first axis of rotation comprising:

a base;

a plurality of independent elongate columns, each column having a first end and second end defining a path of travel along a length thereof, the first end of each mounted to the base in spaced relation to one another;

a cross member engaged with at least two of the plurality of columns for movement along the path of travel;

a first modular die support interchangeable between a first configuration for a low speed die support operable mode of operation below 600

Application Serial No. 09/863,181
Dated: April 18, 2006
Reply to Office Action dated January 18, 2006

Page 16 of 30

linear feet per minute and a second configuration for a high speed die support
operable mode of operation above 600 linear feet per minute and a second modular
die support interchangeable between the first configuration for the low speed die
support mode of operation and the second configuration for the high speed die
support mode of operation, wherein the first and the second modular die supports are
the second configuration for the high speed die supports mode of operation, and
wherein the first rotary die and the second rotary die each further comprise a first end
surface and opposite second end surface, each die having an elongate journal
extending from the first and the second end surfaces along the respective axis of
rotation; and

the first and the second modular die supports each further comprising a
pair of cylindrical roller bearings ~~independent from and~~ spaced from the columns and
positioned along the respective axis of rotation, each cylindrical roller bearing
operably engaged with one of the journals for permitting free rotation of the
respective die about the respective axis of rotation.

55. (Currently Amended) A modular rotary die apparatus ~~for use with~~
having a first rotary die having with a first axis of rotation and a second rotary die
having with a second axis of rotation comprising:

a base;

a plurality of independent elongate columns, each column having a first
end and a second end defining a path of travel along a length thereof, the first end of
each column mounted to the base in spaced relation to one another;

Application Serial No. 09/863,181
Dated: April 18, 2006
Reply to Office Action dated January 18, 2006

Page 17 of 30

a cross member engaged with at least two of the plurality of columns
for movement along the path of travel;

a first modular die support mounted to the base in spaced relation to the columns and a second modular die support mounted to the cross member in spaced relation to the columns, the first modular die support ~~[[solely]]~~ maintaining the first rotary die in a stationary rotary position with respect to the base independent of the columns, the first and the second modular die supports each interchangeable between a first configuration for a low speed mode of operation below 600 linear feet per minute and a second configuration for a high speed mode of operation above 600 linear feet per minute, the first configuration of each of the first and second modular die supports including a first bearing member and a second bearing member, each bearing member having at least two rollers, each roller having an axis of rotation substantially parallel to one another about the respective rotary die axis of rotation, at least one of the rollers operably engaged with a raised radial flange on one of the respective rotary die, and the second configuration of each of the first and second modular die supports including cylindrical roller bearings operably engaged with journals extending from opposite ends of each of the respective rotary die.

56. (Currently Amended) The modular rotary die apparatus of claim 55 wherein both of the first and the second modular die supports comprise one of the interchangeable bearing rollers and the cylindrical roller bearings.

Application Serial No. 09/863,181
Dated: April 18, 2006
Reply to Office Action dated January 18, 2006

Page 18 of 30

57. (Currently Amended) A modular rotary die apparatus ~~for use with~~
having a first rotary die having with a first axis of rotation and a second rotary die
having with a second axis of rotation comprising:

a base;

a plurality of independent elongate columns, each column having a first
end and a second end defining a path of travel along a length thereof, the first end of
each column mounted to the base in spaced relation to one another;

a cross member engaged with at least two of the plurality of columns
for movement along the path of travel;

a first modular die support and a second modular die support in ~~[[sole]]~~
rolling engagement and ~~[[solely]]~~ maintaining the respective first and the second
rotary dies in stationary rotary positions with respect to the base, the first and the
second modular die supports each interchangeable between a first configuration for a
low speed mode of operation below 600 linear feet per minute and a second
configuration for a high speed mode of operation above 600 linear feet per minute,
the first configuration of each of the first and second modular die supports
comprising a first bearing member and a second bearing member, each bearing
member having at least two rollers, each roller having an axis of rotation
substantially parallel to ~~one another about the respective rotary die axis of rotation of~~
the first rotary die and the axis of rotation of the second rotary die, at least one roller
operably engaged with a raised radial flange on one of the respective first and second
rotary die, and the second configuration of each of the first and second modular die
supports comprising first and second cylindrical roller bearings operably engaged

Application Serial No. 09/863,181
Dated: April 18, 2006
Reply to Office Action dated January 18, 2006

Page 19 of 30

with journals extending from opposite longitudinal ends of the respective first and second rotary die, wherein the ~~cylindrical roller bearings further comprise a first~~ cylindrical roller bearing and [[a]] the second cylindrical roller bearing are positioned in spaced relation to the columns, each cylindrical roller bearing operably engaged with the respective journal.

58. (Currently Amended) A modular rotary die apparatus ~~for use with~~ having a first rotary die having with a first axis of rotation and a second rotary die having with a second axis of rotation parallel to the first axis of rotation comprising:
a frame having a first configuration for a low speed mode of operation below 600 linear feet per minute and a second configuration for a high speed mode of operation above 600 linear feet per minute, the frame including:

a base;

a plurality of elongate columns having a first end mounted to the base and a second end;

a cross member positioned opposite the base operably engaged with at least two of the columns adjacent the second ends; and

a die support kit operably engagable with the frame, the die support kit including interchangeable die supports for at least one of the first configuration for low speed mode of operation and the second configuration for high speed mode of operation, the die support kit for the first configuration for low speed mode of operation including:

Application Serial No. 09/863,181
Dated: April 18, 2006
Reply to Office Action dated January 18, 2006

Page 20 of 30

a first modular die support mounted to the base spaced from the columns and consisting of a first bearing member and a second bearing member positioned in longitudinally spaced locations along the axis of rotation of the first rotary die, each bearing member including at least two rollers with axes of rotation located in angularly spaced positions with respect to and parallel to the axis of rotation of the first rotary die, the first and second bearing members in rolling engagement with the first rotary die and maintaining the first rotary die in a stationary rotary position with respect to the base through operable engagement of the rollers with raised radial flanges located on opposite longitudinal ends of the first rotary die; and

a second modular die support mounted to the cross member, each the second modular die support including consisting of a first bearing member and a second bearing member positioned in longitudinally spaced locations along the respective rotary die axis of rotation of the second rotary die, each bearing member including at least two rollers with axes of rotation located in angularly spaced positions with respect to and parallel to the respective rotary die axis of rotation of the second rotary die, the first modular die support bearings and second bearing members in [[sole]] rolling engagement with the respective first second rotary die and [[solely]] maintaining a stationary rotary position of the first the second rotary die in a stationary rotary position with respect to the base independent of the columns through operable engagement of at least one of the first modular die support bearing rollers with a the raised radial flange flanges on the first rotary [[dies]] die with longitudinal ends of the second rotary die.

Application Serial No. 09/863,181
Dated: April 18, 2006
Reply to Office Action dated January 18, 2006

Page 21 of 30

59. (Currently Amended) A modular rotary die apparatus ~~for use with~~
having a first rotary die having with a first axis of rotation and a second rotary die
having with a second axis of rotation parallel to the first axis of rotation comprising:

a frame having a first configuration for a low speed mode of operation
below 600 linear feet per minute and a second configuration for a high speed mode of
operation above 600 linear feet per minute, the frame including:

a base;

a plurality of elongate columns, each column having a first end
mounted to the base in spaced relation to one another and a second end;

a cross member engaged with at least two of the plurality of
columns;

a die support kit operably engagable with the frame, the die support kit
including interchangeable die supports for at least one of the first configuration for
low speed mode of operation and the second configuration for high speed mode of
operation, the die support kit for the second configuration for high speed mode of
operation including:

a first modular die support mounted to the base and consisting
of a first cylindrical roller bearing and a second cylindrical roller bearing positioned
in spaced relation to the columns and spaced in longitudinal relation from one
another along the axis of rotation of the first rotary die, the first and second
cylindrical roller bearings in rolling engagement with the first rotary dies through a
journal extending from each end of the first rotary die, the cylindrical roller bearings

Application Serial No. 09/863,181

Page 22 of 30

Dated: April 18, 2006

Reply to Office Action dated January 18, 2006

maintaining the first rotary die in a stationary rotary position with respect to the base:

and

a second modular die support mounted to the cross member, the ~~first and the~~ second modular die supports ~~each including support consisting of~~ a first cylindrical roller bearing and a second cylindrical roller bearing positioned in spaced relation to the columns and spaced in longitudinal relation from one another along the ~~respective rotary die axis of rotation of the second rotary die, each of~~ the first and the second cylindrical roller bearings including ~~a cylindrical roller bearing spaced from the columns in [[sole]] rolling engagement with the respective first and the second rotary dies die through a journal extending from each end of the respective first and second rotary die, the cylindrical roller bearings [[solely]] maintaining a stationary position of the respective first and the second rotary die in a stationary rotary position~~ with respect to the base independent of the columns.